

IN THE CLAIMS

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please **AMEND** claims 1, 4, 7 and 14-16 in accordance with the following:

1. (CURRENTLY AMENDED) A cache device set up in each of processors, interconnected to other cache devices in other processors and connected to a main memory, which comprises:

a cache memory wherein a part of data in the main memory is stored in one or more cache lines and a state tag ~~using~~used to manage data consistency is set up in each of the cache lines, and

a cache controller ~~for carrying out~~performing, as a pre-fetch protocol, a weak read operation that fails a pre-fetch request following a read request from one of the processors, in a case that if at a time of generation of ~~a~~the pre-fetch request, the state tags of other cache devices must be changed to read following a read request from one of the processors the data stored in the other cache devices ~~must be read by changing state tags of the other cache devices, weak read operation for causing failure in said pre-fetch request as a pre-fetch protocol.~~

2. (ORIGINAL) The cache device according to claim 1, wherein said cache memory distinguishes the stored data by a data-modified state (M), an exclusive state (E), a data-shared state (S) and an invalid state (I), each of which indicates validity of the state tag, and

said cache controller causes failure in said pre-fetch request when the data corresponding to the pre-fetch request stored in the other cache devices is in the data-modified state (M) or the exclusive state (E).

3. (ORIGINAL) The cache device according to claim 1, wherein said cache

controller reads, when the data corresponding to the pre-fetch request and stored in the other cache devices is in the invalid state (I), the same data from said main memory and stores the same data in the exclusive state (E) in the cache memory; and when the data is in the data-shared state (S), the cache controller reads the data from the other cache devices and stores the data in the data-shared state (S) in the cache memory.

4. (CURRENTLY AMENDED) A cache device set up in each of processors, interconnected to other cache devices in other processors and connected to a main memory, which comprises:

a cache memory wherein a part of data in the main memory is stored in one or more cache lines and a state tag ~~using~~used to manage data consistency is set up in each of the cache lines, and

a cache controller in response to a pre-fetch request following a read request from one of the processors, reading data without changing state tags of other cache devices and storing the read data in the cache memory with setup of a weak state (W), if ~~for carrying out a pre-fetch protocol that in a case that~~ at a time of generation of ~~at the~~ pre-fetch request, the state tags of the other cache devices must be changed to read following a read request from one of the processors ~~the data stored in the other cache devices, must be read by changing state tags of the other cache devices, the data is read without changing the state tag and stored in the cache memory with setup of a weak state W, and invalidating the data stored in the cache memory in the weak state W~~ at a time of synchronization operation of memory consistency to attain data-consistency by software ~~the data in the cache memory in said weak state (W) is wholly invalidated.~~

5. (PREVIOUSLY PRESENTED) The cache device according to claim 1, wherein said cache memory distinguishes the stored data by a data-modified state (M), an exclusive state (E), a data-shared state (S) and an invalid state (I), each of which indicates validity of the state tag, and

said cache controller reads, when the data which corresponds to the pre-fetch request and are stored in the other cache devices is in the data-modified state (M) or the exclusive state (E), the data without changing the state tag and stores the data in the cache memory with the setup of the weak state (W), and at the time of synchronization operation of the memory consistency the cache controller changes the weak state (W) into the invalid state (I) wholly.

6. (ORIGINAL) The cache device according to claim 5, wherein said cache controller reads, when the data corresponding to the pre-fetch request and stored in the other cache devices is in the invalid state (I), the same data from said main memory and stores the same data in the exclusive state (E) in the cache memory; and when the data is in the data-shared state (S), the cache controller reads the data from the other cache devices and stores the data in the data-shared state (S) in the cache memory.

7. (CURRENTLY AMENDED) A cache device set up in each of processors, interconnected to other cache devices in other processors and connected to a main memory, which comprises:

a cache memory wherein a part of data in the main memory is stored in one or more cache lines and a state tag ~~using~~used to manage data consistency is set up in each of the cache lines, and

a cache controller ~~for carrying out~~ controlling a pre-fetch protocol according to a process comprising:

setting as ~~the~~a state tag, at ~~the~~a time of generation of a pre-fetch request following a read request from one of the processors, a passive preservation mode P to data pre-fetched from ~~the other~~ cache devices or from the main memory,

storing the pre-fetched data in said cache memory,

not informing the other cache devices of the preservation of the data in said cache memory, when ~~the data corresponding to~~for a read request from the other cache devices ~~is corresponds to~~ the pre-fetch data to which said passive preservation mode P is set, ~~the other cache devices of the preservation of the corresponding data,~~ and

invalidating the pre-fetched data in the cache memory, when according to the read request from the other cache devices, none of the other cache devices store the corresponding data, and preserving said pre-fetch data as it is, when according to the read request from the other cache devices, the other cache devices share the corresponding data.

8. (ORIGINAL) The cache device according to claim 7, wherein said cache memory distinguishes the stored data by a data-modified state (M), an exclusive state (E), a data-shared state (S) and an invalid state (I), each of which indicates validity of the state tag, and

in the case that the data corresponding to the read request from some other cache device is the pre-fetch data to which said passive preservation mode P is set up, said cache controller changes the pre-fetch data stored in the passive preservation mode P into the invalid state (I) when all of the other cache devices are in the invalid state (I), or either one of the other cache devices is in the data-modified state (M) or the exclusive state (E), and the cache device keeps the state of the pre-fetch data stored in the passive preservation mode P as it is when the other cache devices are in the data-shared state (S).

9. (ORIGINAL) The cache device according to claim 7, wherein a normal preservation mode N is set up to data other than the pre-fetch data in the passive preservation mode P stored in said cache memory, and data-preservation in the passive preservation mode P and data-preservation in the normal preservation mode N are carried out in the respective cache lines, and caused to exist together.

10. (PREVIOUSLY PRESENTED) The cache device according to claim 4, wherein said cache controller carries out, when the cache controller receives the read request from said processor, a pre-fetch request for pre-fetching data in one or more addresses adjacent to a read-requested address after said read request.

11. (PREVIOUSLY PRESENTED) The cache device according to claim 1, wherein said cache controller carries out, when the cache controller receives the read request from said processor, a pre-fetch request for pre-fetching data in one or more addresses adjacent to a read-requested address after said read request.

12. (PREVIOUSLY PRESENTED) The cache device according to claim 11, wherein the cache device is interconnected to the other cache devices via a snoop bus for outputting, when said cache controller receives a read request from its own processor or some other cache devices, preservation states of the corresponding data into state controlling lines,

wherein the state controlling lines comprise a first state controlling line that exclusively corresponds to the read request and a second state controlling line that exclusively corresponds to the pre-fetch request,

wherein the cache controller carries out the read request and the pre-fetch request at

same time, and carries out, via the first and second state controlling lines, the states of the respective cache devices about an address of the requested data and an address of the pre-fetch requested data at same time.

13. (ORIGINAL) The cache device according to claim 11, wherein in response to the simultaneous requests of said read request and the pre-fetch request, a distinguishing bit for distinguishing data in response to said read request and data in response to the pre-fetch request is fitted up to a response header, and data making the distinguishing bit valid are transmitted in a lump.

14. (CURRENTLY AMENDED) A method of controlling a cache system wherein cache devices set up in respective processors are mutually connected through an interconnecting network and are connected to a main memory, the method comprising:

storing a part of data in the main memory in one or more cache lines on cache memory and setting up a state tag to manage data consistency in each of the cache lines, and

~~carrying out performing, as pre-fetch protocol, a weak read operation that fails a pre-fetch request following a read request from one of the processors, in a case that~~ if at a time of generation of ~~a~~the pre-fetch request, the state tags of other cache devices must be changed to read the following a read request from one of the processors data stored in the other cache devices must be read by changing state tags of the other cache devices, weak read operation for causing failure in said pre-fetch request as a fetch protocol.

15. (CURRENTLY AMENDED) A method of controlling a cache system wherein cache devices set up in respective processors are mutually connected through an interconnecting network and are connected to a main memory, the method comprising:

storing a part of data in the main memory in one or more cache lines on cache memory and setting up a state tag to manage data consistency in each of the cache lines,

in response to a pre-fetch request following a read request from one of the processor, ~~reading, data without changing state tags of other cache devices and storing the read data in the cache memory with setup of a weak state (W), if in a case that~~ at a time of generation of ~~a~~the pre-fetch request, the state tags of the other cache devices must changed to read following a read request from one of the processors the data stored in the other cache devices ~~must be read by changing state tags of the other cache devices, the data without changing the~~

~~state tag to respond to said processor, and subsequently storing the data, with a setup of a weak state W, in the cache memory, and invalidating, the data stored in the cache memory in the weak state (W) at a time of synchronization operation of memory consistency to attain data-consistency by software, the data in the cache memory in said weak state (W) wholly.~~

16. (CURRENTLY AMENDED) A method of controlling a cache system wherein cache devices set up in respective processors are mutually connected through an interconnecting network and are connected to a main memory, the method comprising:

storing a part of data in the main memory in one or more cache lines on cache memory and setting up a state tag to manage data consistency in each of the cache lines,

setting as ~~the~~ a state tag, at ~~the~~ a time of generation of a pre-fetch request following a read request from one of the processors, a passive preservation mode P to data pre-fetched from ~~the~~ other cache devices or the main memory and storing the pre-fetched data in said cache memory,

not informing the other cache devices of the preservation of the data in said cache memory, when data ~~corresponding to~~ for a read request from the other cache devices is ~~corresponds to~~ the pre-fetch data to which said passive preservation mode P is set, ~~the other cache devices of preservation of the corresponding data, and~~

invalidating said pre-fetch data when, according to the read request from the other cache devices, none of the cache devices store the corresponding data, and storing said pre-fetch data as it is when, according to the read request from the other cache devices, the corresponding data is shared by the other cache devices.